

Q/C



Docket No.: 60188-432

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Yoshiaki HASEGAWA, et al.

Serial No.: 09/993,771

Patent No.: 6,709,881

Filed: November 27, 2001

Issued: March 23, 2004

For: METHOD FOR MANUFACTURING SEMICONDUCTOR LASER OPTICAL DEVICE
(As Amended)

: Customer Number: 20277

: Confirmation Number: 7630

: Group Art Unit: 2812

: Examiner: SAVITRI MULPURI

REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 CFR 1.322

Mail Stop
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Certificate
JUL 09 2004
of Correction

In reviewing the above-identified patent, a printing error was discovered therein requiring correction in order to conform the Official Record in the application.

The error noted is set forth on the two attached copies of form PTO-1050 Rev. 2-93 in the manner required by the Commissioner's Notice.

Specifically, On the Title Page of the Letters Patent and Column One;, Under section "(54)" and under column one, change " METHOD FOR MANUFACTURING SEMICONDUCTOR AND METHOD FOR MANUFACTURING SEMICONDUCTOR DEVICE " to – METHOD FOR MANUFACTURING SEMICONDUCTOR LASER OPTICAL DEVICE –. For your immediate reference attached is a photocopy of the Part B-Fee Transmittal (form PTOL-85), filed November 24, 2003 and Amendment filed April 7, 2003.

Patent No.: 6,709,881

The change requested herein occurred as a result of printing the Letters Patent and the Certificate should be issued without expense under Rule 322 of the Rules of Practice. Accordingly, Applicants request issuance of the Certificate of Correction.

Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT WILL & EMERY LLP



Michael E. Fogarty
Registration No. 36,139

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 MEF:jgh
Facsimile: (202) 756-8087
Date: July 7, 2004

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,709,881 B2
DATED : March 23, 2004
INVENTOR(S) : Yoshiaki HASEGAWA, et al.

It is certified that error appears in the above-identified patent and that said Letter Patent is hereby corrected as shown below:

On the Title Page of the Letters Patent and Column One;

Under section "(54)" and under column one, change " METHOD FOR
MANUFACTURING SEMICONDUCTOR AND METHOD FOR
MANUFACTURING SEMICONDUCTOR DEVICE " to – METHOD FOR
MANUFACTURING SEMICONDUCTOR LASER OPTICAL DEVICE –

MAILING ADDRESS OF SENDER:
McDermott Will & Emery LLP
600 13th Street, NW
Washington, DC 20005
USA

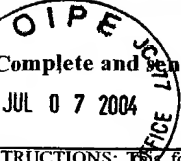
PATENT NO.
6,709,881

No. of add'l copies
@ 50¢ per page

}

FORM PTO 1050 (Rev. 2-93)

12 JUL 2004



ART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop **ISSUE FEE**
Commissioner for Patents
Alexandria, Virginia 22313-1450
or **Fax** (703) 746-4000

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 4 should be completed where appropriate. All other correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated on the front of the patent or corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

22204 7590 09/23/2003
NIXON PEABODY, LLP
8180 GREENSBORO DRIVE
SUITE 600
MCLEAN, VA 22102

McDermott, Will + Emery
600 13th Street, N.W.
Washington, DC
20005

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/993,771	11/27/2001	Yoshiaki Hasegawa	0819-0703	7630

TITLE OF INVENTION: METHOD FOR MANUFACTURING SEMICONDUCTOR LASER OPTICAL DEVICE

60188-432

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1300 1330 -	\$300	\$1600 1630 -	12/23/2003
EXAMINER		ART UNIT	CLASS-SUBCLASS		
MULPURI, SAVITRI		2812	438-024000		

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

- McDERMOTT, WILL & EMERY
-
-

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the USPTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

Osaka, JAPAN

Please check the appropriate assignee category or categories (will not be printed on the patent); ☐ individual ☒ corporation or other private group entity ☐ government

4a. The following fee(s) are enclosed:

☒ Issue Fee

☒ Publication Fee

☒ Advance Order - # of Copies 4

4b. Payment of Fee(s):

☐ A check in the amount of the fee(s) is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☒ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number 500417 (enclose an extra copy of this form).

Director for Patents is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.

(Authorized Signature)

(Date)

Michael E. Fogarty, Reg. #36,139 11/24/2003

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMIT THIS FORM WITH FEE(S)

PTOL-85 (Rev. 08/03) Approved for use through 04/30/2004.

OMB 0651-0033

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INVOCATION OF POWER OF ATTORNEY

12 JUL 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

This will acknowledge receipt of the following:

1. Transmittal Form with Certificate of Mailing
2. Fee Transmittal Form with Certificate of Mailing
3. Amendment (12 pages)
4. Request for Extension of Time
5. Check No. _____ in the amount of \$110.00 (EOT-\$110.00)

In re Patent Application of:

Inventor(s): Yoshiaki HASEGAWA et al.

Serial No.: 09/993,771

Filed: November 27, 2001

Title: METHOD FOR MANUFACTURING SEMICONDUCTOR AND METHOD FOR
MANUFACTURING SEMICONDUCTOR DEVICE

Due Date: 04-20-03

Docket No. 740819-703

DRS/JWM/adc

Date: 04-7-03

PLEASE DATE STAMP AND RETURN

THIS DOCUMENT HAS VISIBLE AND INVISIBLE FLUORESCENT FIBERS - VIEW UNDER BLACK LIGHT - TRUE WATERMARK IN PAPER - HOLD TO LIGHT TO VIEW
4/7/2003

NIXON PEABODY LLP
ATTORNEYS AT LAW

PATENT DISBURSEMENT ACCOUNT
8180 Greensboro Drive
Suite 800
McLean, VA 22102

CHASE MANHATTAN BANK, N.A.
ROCHESTER, NY

7523

PAY THE SUM 110 DOLLARS AND 00 CENTS

110.00

TO THE ORDER OF COMMISSIONER FOR PATENTS AND TRADEMARKS

PAY EXACTLY

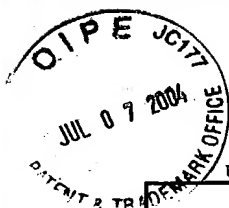
Vendor # 740101
Request # 478847

740819-703

Sandra R. Little

DOCUMENT CONTAINS VOID PANTOGRAPH AND MICRO-PRINT SIGNATURE LINE - MAGNIFY TO VIEW

⑈007523⑈ ⑆022300173⑆512060452⑈



Please type a plus sign (+) inside this box → [+]

PTO/SB/21 (08-00)

Approved for use through 10/31/2002. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM (to be used for all correspondence after initial filing)	Application Number	09/993,771	
	Filing Date	November 27, 2001	
	First Named Inventor	Yoshiaki HASEGAWA et al.	
	Group Art Unit	2812	
	Examiner Name	Mulpuri, Savitri	
Total Number of Pages in This Submission		Attorney Docket Number	740819-703

ENCLOSURES (check all that apply)		
<input checked="" type="checkbox"/> Fee Transmittal Form <input checked="" type="checkbox"/> Fee Attached <input checked="" type="checkbox"/> Amendment / Reply <input type="checkbox"/> After Final <input type="checkbox"/> Affidavits/declaration(s) <input checked="" type="checkbox"/> Extension of Time Request <input type="checkbox"/> Express Abandonment Request <input type="checkbox"/> Information Disclosure Statement <input type="checkbox"/> Certified Copy of Priority Document(s) <input type="checkbox"/> Response to Missing Parts/Incomplete Application <input type="checkbox"/> Response to Missing Parts under 37 CFR 1.52 or 1.53	<input type="checkbox"/> Assignment Papers (for an Application) <input type="checkbox"/> Drawing(s) <input type="checkbox"/> Declaration and Power of Attorney <input type="checkbox"/> Licensing-related Papers <input type="checkbox"/> Petition <input type="checkbox"/> Petition to Convert to a Provisional Application <input type="checkbox"/> Power of Attorney, Revocation Change of Correspondence Address <input type="checkbox"/> Terminal Disclaimer <input type="checkbox"/> Request for Refund <input type="checkbox"/> CD, Number of CD(s) _____	<input type="checkbox"/> After Allowance Communication to Group <input type="checkbox"/> Appeal Communication to Board of Appeals and Interferences <input type="checkbox"/> Appeal Communication to Group (Appeal Notice, Brief, Reply Brief) <input type="checkbox"/> Proprietary Information <input type="checkbox"/> Status Letter <input type="checkbox"/> Application Data Sheet <input type="checkbox"/> Other Enclosure(s) (please identify below):
Remarks	<input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees required or credit any overpayments to Deposit Account No. 19-2380 (740819-703) for the above identified docket number.	

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT	
Firm or Individual name	Jeffrey L. Costellia, Reg. No. 35,483 Nixon Peabody LLP 8180 Greensboro Drive Suite 800 McLean, VA 22102
Signature	
Date	April 7, 2003

CERTIFICATE OF MAILING			
I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231 on this date: <u>4-7-03</u>			
Type or printed name	April Campbell		
Signature		Date	April 7, 2003

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, Washington, DC 20231.

NVA260920.1

12 JUL 2004

PTO/SB/17 (10-02)
Approved for use through 10/31/2002. OMB 0651-0032

FEE TRANSMITTAL FOR FY 2003

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$110.00)

Complete if Known	
Application Number	09/993,771
Filing Date	November 27, 2001
First Named Inventor	Yoshiaki HASEGAWA et al.
Examiner Name	Mulpuri, Savitri
Art Unit	2812
Attorney Docket No.	740819-703

METHOD OF PAYMENT (check all that apply)

☒ Check ☐ Credit Card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 19-2380 (740819-703)

Deposit Account Name: Nixon Peabody LLP

The Commissioner is authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☒ Credit any overpayments

☒ Charge any additional fee(s) during the pendency of this application

☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Fee (\$)	Small Entity Fee Code	Fee (\$)	Fee Description	Fee Paid
1001	750	2001	375	Utility filing fee	
1002	330	2002	165	Design filing fee	
1003	520	2003	260	Plant filing fee	
1004	750	2004	375	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) (\$ 0)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee from below	Fee Paid
-20** =	X		0
Independent Claims	-3** =	X	0
Multiple Dependent	X		0

Large Entity Fee Code	Fee (\$)	Small Entity Fee Code	Fee (\$)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	84	2201	42	Independent claims in excess of 3
1203	280	2203	140	Multiple dependent claim, if not paid
1204	84	2204	42	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 0)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Fee (\$)	Small Entity Fee Code	Fee (\$)	Fee Description
1051	130	2051	65	Surcharge - late filing fee or oath
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet
1053	130	1053	130	Non-English specification
1812	2,520	1812	2,520	For filing a request for <i>ex parte</i> reexamination
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action
1251	110	2251	55	Extension for reply within first month
1252	410	2252	205	Extension for reply within second month
1253	930	2253	465	Extension for reply within third month
1254	1,450	2254	725	Extension for reply within fourth month
1255	1,970	2255	985	Extension for reply within fifth month
1401	320	2401	160	Notice of Appeal
1402	320	2402	160	Filing a brief in support of an appeal
1403	280	2403	140	Request for oral hearing
1451	1,510	1451	1,510	Petition to institute a public use proceeding
1452	110	2452	55	Petition to revive - unavoidable
1453	1,300	2453	650	Petition to revive - unintentional
1501	1,300	2501	650	Utility issue fee (or reissue)
1502	470	2502	235	Design issue fee
1503	630	2503	315	Plant issue fee
1460	130	1460	130	Petitions to the Commissioner
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)
1806	180	1806	180	Submission of Information Disclosure Stmt
8021	40	8021	40	Recording each patent assignment per property (times number of properties)
1809	750	2809	375	Filing a submission after final rejection (37 CFR 1.129(a))
1810	750	2810	375	For each additional invention to be examined (37 CFR 1.129(b))
1801	750	2801	375	Request for Continued Examination (RCE)
1802	900	1802	900	Request for expedited examination of a design application

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$110.00)

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, Washington, DC 20231, on April 7, 2003.

Name: April Campbell

SUBMITTED BY

Name (Print/Type)	Jeffrey L. Costellia	Registration No. (Attorney/Agent)	35,483	Telephone	(703) 770-9300
Signature		Date	April 7, 2003		



Application No. 09/993,771
Docket No. 0819-0703

- 1 -

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)
Yoshiaki HASEGAWA et al.) Art Unit: 2812
Serial No. 09/993,771)
Filed: November 27, 2001) Examiner: Mulpuri, Savitri
For: METHOD FOR MANUFACTURING)
SEMICONDUCTOR AND METHOD)
FOR MANUFACTURING)
SEMICONDUCTOR DEVICE)

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with
The United States Postal Service with sufficient postage as First
Class Mail in an envelope addressed to: Commissioner for Patents,
Washington, D.C. 20231, on April 7, 2003
April Campbell
April Campbell

AMENDMENT

Honorable Commissioner of Patents
Washington, D.C. 20231

Sir:

The following is presented in response to the Office Action mailed December 20, 2002, in connection with the above-identified patent application. Please amend the above identified patent application as follows:

In accordance with the guidelines and waived provisions of 37 C.F.R. 1.121 promulgated in the USPTO announcement of January 31, 2003, please make the following amendments.

IN THE SPECIFICATION:

Before the first line of the specification, please replace the current title of the invention with the following new title of the invention:

~~METHOD FOR MANUFACTURING SEMICONDUCTOR AND METHOD~~
~~FOR MANUFACTURING SEMICONDUCTOR DEVICE- METHOD FOR~~
~~MANUFACTURING SEMICONDUCTOR LASER OPTICAL DEVICE~~

IN THE CLAIMS:

1. (Cancelled)
2. (Cancelled)
3. (Cancelled)
4. (Currently Amended) ~~The method for manufacturing a semiconductor of claim 1~~ A method for manufacturing a semiconductor laser optical device, comprising:
a first step of forming an etching stop layer on a first semiconductor layer; and
a second step of forming a second semiconductor layer made of a group III-V compound semiconductor on the etching stop layer,
wherein an etching rate for the etching stop layer by dry etching is less than an etching rate for the second semiconductor layer, and wherein in the first step, the etching stop layer is a super lattice layer obtained by alternately layering an $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer (where $0 \leq x \leq 1$) and an $\text{Al}_y\text{Ga}_{1-y}\text{N}$ layer (where $0 \leq y \leq 1$ and $x \neq y$) on one another, thereby functioning as a reflector mirror having a thickness such as to reflect light whose wavelength is equal to or greater than about 360 nm and less than or equal to 500 nm, and the thickness of each $\text{Al}_x\text{Ga}_{1-x}\text{N}$ and each $\text{Al}_y\text{Ga}_{1-y}\text{N}$ layer is $\lambda / (4n)$ wherein λ denotes an oscillation wavelength of the semiconductor laser optical device, and n denotes a refractive index of each $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer and each $\text{Al}_y\text{Ga}_{1-y}\text{N}$ layer.
5. (Cancelled)
6. (Cancelled)
7. (Currently Amended) ~~The method for manufacturing a semiconductor of claim 6, wherein the element included in the group III-V nitride semiconductor is nitrogen, and the impurity element is silicon~~ A method for manufacturing a semiconductor laser optical device, comprising:

a first step of forming an etching stop layer on a first semiconductor layer; and
a second step of forming a second semiconductor layer made of a group III-V
compound semiconductor on the etching stop layer,

wherein an etching rate for the etching stop layer by dry etching is less than an
etching rate for the second semiconductor layer, and the etching stop layer is made of an
insulating film composed of silicon nitride.

8. ~~(Currently Amended) The method for manufacturing a semiconductor of~~
~~claim 6,~~ A method for manufacturing a semiconductor laser optical device, comprising:
a first step of forming an etching stop layer on a first semiconductor layer; and
a second step of forming a second semiconductor layer made of a group III-V
compound semiconductor on the etching stop layer,

wherein an etching rate for the etching stop layer by dry etching is less than an
etching rate for the second semiconductor layer, the first semiconductor layer includes
magnesium, the etching stop layer is made of an element included in a group III-V
nitride semiconductor and an impurity element that determines a conductivity of the
group III-V nitride semiconductor, and wherein the impurity element is magnesium, and
an amount of magnesium included in the etching stop layer is more than an amount of
magnesium included in the first semiconductor layer.

9. (Currently Amended) The method for manufacturing a semiconductor laser
optical device of claim 8, wherein an impurity concentration the amount of magnesium
included in the etching stop layer is about $1 \times 10^{20} \text{ cm}^{-3}$ or more.

10. (Cancelled)

11. ~~(Currently Amended) The method for manufacturing a semiconductor of~~
~~claim 10,~~ A method for manufacturing a semiconductor laser optical device, comprising:
a first step of forming an etching stop layer on a first semiconductor layer; and
a second step of forming a second semiconductor layer made of a group III-V

compound semiconductor and including Al on the etching stop layer,

wherein an etching rate for the etching stop layer by dry etching is less than an etching rate for the second semiconductor layer,

the method further comprises a third step of performing a dry etching process on the second semiconductor layer, after the second step, wherein in the third step,

the etching process on the second semiconductor layer is stopped upon detecting the etching stop layer, the etching stop layer includes Al, an amount of Al included in the etching stop layer is more than an amount of Al included in the second semiconductor layer, and wherein the third step includes the steps of:

irradiating a surface of the second semiconductor layer with a laser beam;
receiving photoluminescence light emitted through excitation by the laser beam;
and

assuming that a surface of the etching stop layer has been exposed by
~~detecting a change in~~ when a wavelength of the received photoluminescence light
is shortened.

12. (Currently Amended) ~~The method for manufacturing a semiconductor of claim 10;~~ A method for manufacturing a semiconductor laser optical device, comprising:

a first step of forming an etching stop layer on a first semiconductor layer; and
a second step of forming a second semiconductor layer made of a group III-V compound semiconductor and including Al on the etching stop layer,

wherein an etching rate for the etching stop layer by dry etching is less than an etching rate for the second semiconductor layer,

the method further comprising a third step of performing a dry etching process on the second semiconductor layer, after the second step, wherein in the third step, the etching process on the second semiconductor layer is stopped upon detecting the etching stop layer, the etching stop layer includes Al, an amount of Al included in the etching

stop layer is more than an amount of Al included in the second semiconductor layer, and
wherein the third step includes the steps of:

irradiating a surface of the second semiconductor layer with X rays;

measuring a diffraction angle of the X rays; and

assuming that a surface of the etching stop layer has been exposed by
~~detecting a change in~~ when the diffraction angle ~~of the X rays~~ increases.

13. (Cancelled)

REMARKS

The Examiner's Office Action dated December 20, 2002 has been received and its contents carefully noted. The Applicants respectfully submit that this response is timely filed and fully response to the Office Action. By the above amendments, claims 4, 7, 8, 9, 11 and 12 have been amended, and claims 1-3, 5, 6, 10 and 13 have been cancelled. Consequently, claims 4, 7, 8, 9, 11 and 12 are currently pending. Support for the presently claimed subject matter is as follows:

Claim 4 is supported by page 25, line 10, to page 26, line 2,

Claim 7 is supported by page 6, lines 4-11,

Claim 8 is supported by page 41, lines 2-8,

Claim 11 is supported by page 30, line 25, to page 31, line 10,

Claim 12 is supported by page 33, lines 10-22, of the specification.

In light of the above amendments and detailed arguments to follow, reconsideration of the currently proposed rejections, including the rejection of claim "9-12" (which apparently should have been claims 10-12), under § 112 (second paragraph), is respectfully requested.

With regard to the other rejections of:

Claims 1-3, 6, 8 and 13, under 35 U.S.C. 102(e), as being anticipated by the teachings of Nakamura et al. (US 2002/0167018),

Claims 4 5 and 7, under 35 U.S.C. 103(a), as being obvious in view of the teachings of Nakamura et al. (US 2002/0167018) combined with the teachings of Ono et al. ('835), and

Claims 11 and 12, under 35 U.S.C. 103(a), as being obvious in view of the teachings of Nakamura et al. (US 2002/0167018) combined with the teachings of the Chen et al. (J. of Appl. Physics) article,

each of these rejections is respectfully traversed.

The presently claimed invention of independent claim 4 sets forth the features that the etching stop layer functions as a reflective mirror and is composed of a super lattice layer obtained by alternating layers of $\text{Al}_x\text{Ga}_{1-x}\text{N}$ and $\text{Al}_y\text{Ga}_{1-y}\text{N}$, and a thickness of each $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer and each $\text{Al}_y\text{Ga}_{1-y}\text{N}$ layer is $\lambda / (4n)$ (where, λ denotes an oscillation wavelength of the semiconductor laser optical device, and n denotes a refractive index of each $\text{Al}_x\text{Ga}_{1-x}\text{N}$ layer and each $\text{Al}_y\text{Ga}_{1-y}\text{N}$ layer). With this configuration, the super lattice layer becomes the Bragg reflector mirror during light-emission of the semiconductor laser optical device, and leakage of light from the active layer to the outside can be prevented.

The presently claimed invention of independent claim 7 sets forth the feature that the etching stop layer is made of an insulating film composed of silicon nitride in order that the etching selectivity ratio between the silicon nitride and the second semiconductor layer can be increased, thereby improving the etching controllability for the second semiconductor layer.

The presently claimed invention of independent claim 8 sets forth the features the etching stop layer and the first semiconductor layer include magnesium, and the amount of magnesium included in the etching stop layer is more than an amount of magnesium included in the first semiconductor layer.

The presently claimed invention of independent claim 11 sets forth the features that the amount of Al included in the etching stop layer is more than the amount of Al included in the second semiconductor layer, the wavelength of the photoluminescence light is emitted through excitation by the laser beam, and, by utilizing the differences caused by the composition of the surface on which the laser beam is irradiated, it is assumed (determined) the surface of the etching stop layer has been exposed when the wavelength of the photoluminescence light is shortened.

The presently claimed invention of independent claim 12 sets forth the features that the amount of Al included in the etching stop layer is more than the amount of Al

included in the second semiconductor layer, the diffraction angle is measured when the X ray irradiated, and by utilizing the differences caused by the composition of the surface on which the X ray is irradiated, it is assumed (determined) that the surface of the etching stop layer has been exposed when the diffraction angle increases.

Neither Nakamura et al. (US2002/0167018 A1) (hereinafter "Nakamura"), Ono (U.S. Patent No. 5,757,835) (hereinafter "Ono") and/or the Chen et al. article (hereinafter "Chen"), teach or suggest each of the above features of claims 4, 7, 8, 11 and 12.

With regard to claim 4, Nakamura fails to disclose the super lattice layer specifically claimed; while Ono (which is not discussed at all by the Examiner's rejection of claims 4, 5 and 7 under § 103(a)) teaches using a super lattice layer as an etching stop layer, but fails to teach or suggest that by setting the thickness of each layer of the alternating layers forming the super lattice layer to $\lambda / (4n)$ the super lattice layer becomes a reflective mirror when the semiconductor laser optical device is emitted.

Further, according to the amended claim 4, leakage of light from the active layer to the outside can be prevented when the etching stop layer is used as a reflective mirror composed of the super lattice layer. However, Ono also fails to discuss the leakage of light from the active layer. Since both Nakamura and Ono fail to disclose the above features of amended claim 4, a *prima facie* case of obviousness has not been set forth under § 103(a), and claim 4 is therefore patentable over Nakamura and Ono, either individually or in combination.

With regard to amended claim 7, the etching stop layer is made of an insulating film composed of silicon nitride. Indeed, it is well known that in order to achieve an n-type semiconductor having GaN as a main constituent, the semiconductor is doped with Si. However, it is also well known that such Si doped GaN is conductive. Hence, even if the semiconductor disclosed in Nakamura and Ono has GaN as a main constituent, and is doped with Si in order to obtain an n-type semiconductor, the semiconductor does not

become an insulating film as presently claimed. Since both Nakamura and Ono fail to disclose the above features of amended claim 7, a *prima facie* case of obviousness, under § 103(a), has not been set forth, and claim 7 is therefore patentable over Nakamura and Ono, either individually or in combination.

With regard to amended claim 8, the amount of magnesium included in the etching stop layer is more than an amount of magnesium included in the first semiconductor layer. However, Nakamura, at paragraph [0048], discloses that the density of Mg included in the etching stop layer (17) is $1 \times 10^{18} \text{cm}^{-3}$, which is the same as that included in the second p-type cladding layer (11). Further, the density of Mg included in the p-type contact layer (10) deposited on the second p-type cladding layer (11) is $5 \times 10^{18} \text{cm}^{-3}$, which is more than that included in the etching stop layer (17). Nakamura also fails to disclose utilizing the differences in the amount of Mg to differentiate the etching rate. Therefore, since Nakamura fails to disclose the presently claimed difference in the amount of magnesium included in the etching stop layer and the first semiconductor layer as set forth in claim 8, anticipation is not established with regard to claim 8 by the Nakamura reference. Hence, the presently amended claim 8 is patentable over Nakamura.

Further, neither Ono or the Chen article disclose or suggest the claimed Mg density of the layers of the presently amended claim 8. Therefore, the amended claim 8 is patentable over Nakamura, Ono and Chen either individually or in combination.

With regard to amended claim 11, by utilizing the differences caused by the composition of the surface on which the laser beam is irradiated, it can be assumed (determined) that the surface of the etching stop layer has been exposed when the wavelength of the photoluminescence light is shortened. Neither Nakamura or the Chen article teach or suggest this feature. Specifically, the Chen articles disclose:

“We use the photoluminescence (PL) technique to study the optical quality of the etched GaN surface”

at page 649, right column (lines 14-15).

However, Chen fails to teach or suggest the presently claimed phenomenon that the measured wavelength of the photoluminescence light is shortened when the amount of Al on the surface of the semiconductor irradiated by the laser beam increases, and utilizing this phenomenon to assume (determine) the surface of the etching stop layer has been exposed.

The Chen article also discloses:

“We observed a wavelength shift of the yellow luminescence (YL) peak”

in page 649, right column (lines 13-14). However, the authors fail to disclose the relationship between the wavelength shift of the yellow luminescence (YL) peak and the nitride semiconductor composed of AlGa_N. Additionally, according to the “Ti/Al” layer disclosed at page 649, right column (line 16), it is obvious that “Ti/Al” is a metal layer and not a nitrided semiconductor composed of AlGa_N. Since both Nakamura and the Chen article fail to disclose the above features of amended claim 11, a *prima facie* case of obviousness, under § 103(a), has not been set forth, and claim 11 is therefore patentable over the combination of teachings of Nakamura and Chen.

With regard to amended claim 12, by utilizing the differences caused by the composition of the surface on which the X ray is irradiated, it can be assumed (determined) that the surface of the etching stop layer has been exposed when the diffraction angle increases. Nakamura fails to teach or suggest the diffraction angle measured when the X ray irradiates; while the Chen article discloses:

“Also, the near surface structure of GaN was studied by low angle X-ray diffraction”

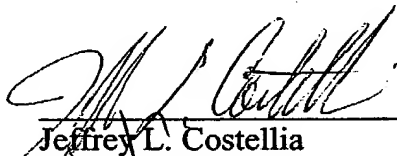
in page 649, right column (line 19) to page 650, left column (line 2). However, the Chen article fails to teach or suggest the phenomenon that the measured diffraction angle increases when the amount of Al on the surface of the semiconductor irradiated by the X ray increases, and fails to teach utilizing the phenomenon to assume (determine) that the

surface of the etching stop layer has been exposed. Since both Nakamura and the Chen article fail to disclose the above features of amended claim 12, a *prima facie* case of obviousness, under § 103(a), has not been set forth, and claim 12 is therefore patentable over the combination of teachings of Nakamura and Chen.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with Applicants' representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Lastly, it is noted that a separate Extension of Time Petition (one month) accompanies this response along with a check in payment of the requisite extension of time fee. However, should that petition become separated from this Amendment, then this Amendment should be construed as containing such a petition. Likewise, any overage or shortage in the required payment should be applied to Deposit Account No. 19-2380 (740819-703).

Respectfully submitted,



Jeffrey L. Costellia
Registration No. 35,483

Nixon Peabody LLP
8180 Greensboro Drive, Suite 800
McLean, Virginia 22102
(703) 770-9300
(703) 770-9400 fax

JLC/JWM